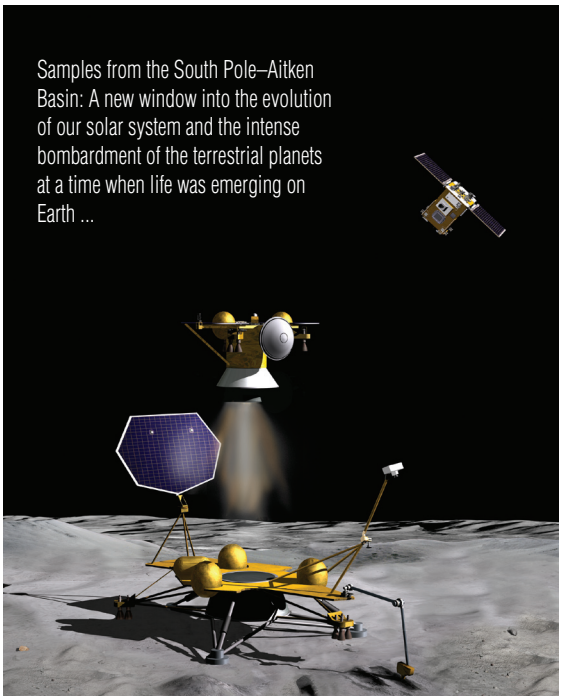
NASAfacts

MoonRise

A Sample-Return Mission from the Moon's South Pole–Aitken Basin



The Moon is a witness to 4.5 billion years of solar system history, including the intense heavy bombardment of the Earth and Moon that is thought to have occurred 3.9 to 4.0 billion years ago. The unique SPA Basin represents a window into the deep crust of the Moon and a portal to the history of this heavy bombardment period, one of the most significant events in the early formation of our solar system, and one that has affected all the terrestrial planets.

MoonRise would be the first U. S. and NASA robotic mission to return rock samples from the Moon. At least 1 kilogram of samples would be collected from the giant South Pole–Aitken (SPA) Basin on the far side of the Moon and returned to Earth for detailed preliminary examination and data analysis by the MoonRise science team and others in the lunar and planetary science communities.

The SPA Basin (located between the Moon's South Pole and Aitken Crater, just 16° south of the Moon's equator) is the oldest, deepest, observable impact basin on the Moon and ranks among the largest recognized impact structures in the solar system at nearly 2500 kilometers (1553.4 miles) in diameter and 12 kilometers (7.5 miles) deep. MoonRise would test the Lunar Cataclysm Hypothesis by determining the age of the oldest and largest recognized impact basin on the Moon. Returned samples would also help to determine the chronology of impacts recorded in rocks and rock fragments within the basin, as well as variations in the composition of materials that make up the basin deposits.

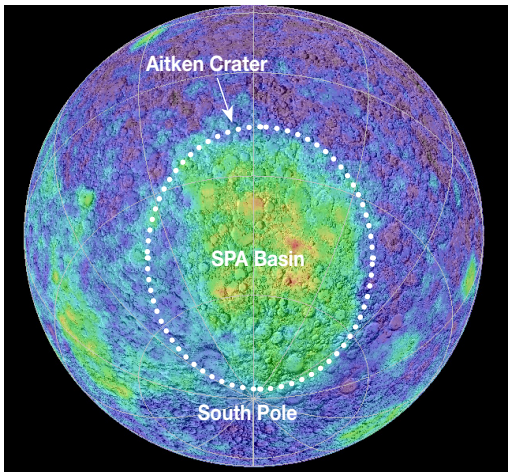
Mission at a Glance

- Launch: October 2016, on an Atlas V-531 from Cape Canaveral, Florida
- Lunar landing: March 2017, at the South Pole–Aitkin Basin, following a trans-lunar cruise phase
- Lunar ascent: March 2017, following about 10 days of surface operations
- Sample return: August 2017, to Earth, following a trans-Earth cruise phase
- Sample analysis: August 2017 to August 2018

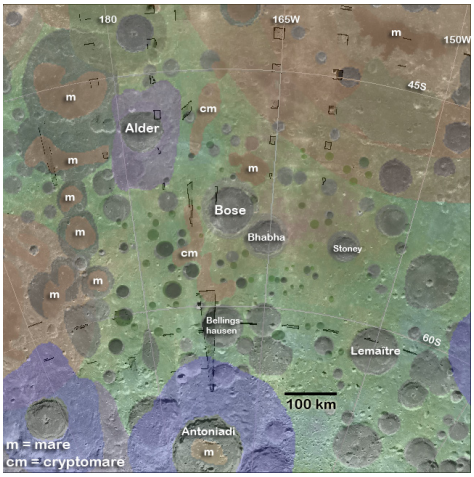
MoonRise Science Objectives

- Determine the SPA Basin impact chronology.
- Investigate processes associated with formation of large impact basins.
- Investigate the materials excavated from the deeper crust and possibly the mantle of the Moon within the SPA Basin.
- Determine the rock types and distribution of thorium and implications for the Moon's thermal evolution.
- Sample and analyze basaltic rock and volcanic glass, which record the composition and chemical evolution of the Moon's far-side mantle beneath the SPA Basin.

MoonRise Landing Site



The enriched FeO signature of the SPA Basin's interior reflects the major compositional region targeted by MoonRise.



Vast regions (shown in light green) of the SPA Basin interior meet the science criteria for an acceptable landing site.

MoonRise would document the geologic context of the landing site with high-resolution and multispectral surface imaging, and would sieve a volume of soil near the lander to collect thousands of rock fragments. The regolith is well mixed from impact processes, so small rock fragments are expected to represent a broad area of the SPA Basin interior. Sample materials would be returned to Earth for mineralogical and chemical analyses, and isotopic age determinations in state-of-the-art laboratories. MoonRise samples would be made available for study by the scientific community worldwide.

MoonRise Team

Principal Investigator	Bradley Jolliff, Washington University in St. Louis
Project Management, Systems Engineering, Mission Design, Navigation, and Operations	Jet Propulsion Laboratory, California Institute of Technology
Flight System Implementation	Lockheed Martin Space Systems
NASA Centers	Ames Research Center, Johnson Space Center, and Langley Research Center
Partners	Canadian Space Agency; Deutsches Zentrum für Luft und Raumfahrt (DLR), Berlin/Oberpfaffenhofen and Mullard Space Science Laboratory, University College, London; and Malin Space Science Systems
Collaborator	JAXA Kaguya Imaging/Mineralogy Team

Lunar Pristine Lab, Johnson Space Center

Science Institutions

Washington University in St. Louis, St. Louis, MO
Brown University, Providence, RI
Canadian Space Agency and the University of W. Ontario, London, Ontario
College of Charleston, Charleston, SC
DLR, Institute of Planetary Research, Berlin
Harvard University, Cambridge, MA
Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA
Purdue University, Lafayette, IN
University of Arizona, Tucson, AZ
University of California at Los Angeles, Los Angeles, CA
University of Hawaii, Honolulu, HI
University of New Mexico, Albuquerque, NM
NASA Johnson Space Center, Houston, TX
Lawrence Livermore National Laboratory, Livermore, CA
Lunar Geotechnical Institute, Lakeland, FL
NASA Marshall Space Flight Center, Huntsville, AL
Mullard Space Science Laboratory, University College, London
U. S. Geological Survey, Flagstaff, AZ
Australian National University, Canberra
Institut de Physique du Globe de Paris, Paris
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For more information about MoonRise, go to:

http://moonrise.jpl.nasa.gov